Aston University
Life & Health Sciences

Title of the study: Investigating eye shape and its effect on focusing in Down's syndrome

(Full title study: Investigating ocular morphological differences as the possible cause of accommodation deficits in Down's syndrome)

End of study report – summary of results

Thank you again for taking part in our study at the Aston School of Optometry, Aston University. Thanks to the help of all the people who took part in our study we have found the answer to our question, and we now know more about near focus in people with Down's syndrome.

This is a report with the summary of the study and its findings for your information.

Why was this study conducted?

Research has shown that a large proportion of individuals with Down's syndrome struggle to focus at near, even with their glasses, and that bifocal glasses are successful at improving this focusing ability. However, the origin and mechanisms behind this poor near focusing are still unknown. This study investigated the characteristics of the eye structures involved in the process of focusing at near in people with and without Down's syndrome to further understand this deficit and its mechanisms. In particular we were interested in the shape and size (thickness and length) of the *ciliary muscle*, which is the muscle inside the eye which contracts during the process of focusing at near. This muscle can be thought as the "engine" of near focusing.

Differences in the shape and size (thickness and length) of this muscle between people with and without Down's syndrome could explain or partially explain the focusing deficit frequently found in Down's syndrome.

How did we study differences in the ciliary muscle shape and size in people with and without Down's syndrome?

To investigate whether or not the shape and size (thickness and length) of the ciliary muscle is different between people with and without Down's syndrome we took pictures of all the participants eyes using a special camera. We asked all participants to place their chin and forehead on a rest and look at a light placed at the left and right hand side of the camera. The picture below shows the special camera while some pictures were being taken from a participant.

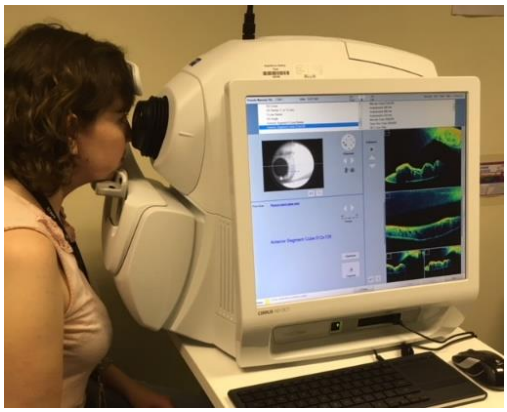

Figure 1. Participant having pictures taken of her eye for the study.

After taking the pictures of the eyes we looked at all of these and using a computer we measured the length and the thickness of the ciliary muscle from each picture. Below there is a picture of a ciliary muscle (highlighted by the blue lines) obtained from a participant. The yellow lines in the picture show the different measurements of thickness and length we made of this muscle.

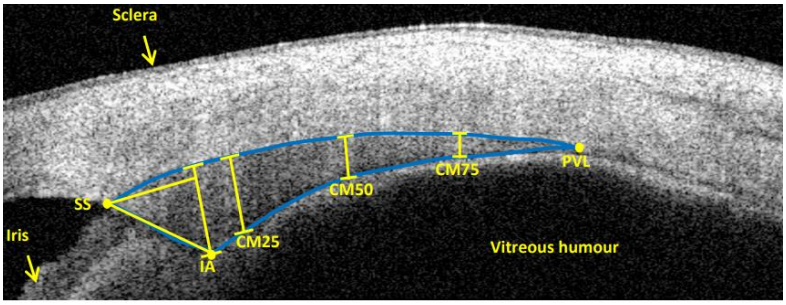

Figure 2. Picture of the ciliary muscle from a participant and the measurements of thickness and length obtained.

During the study we also measured how well all participants could see and how well they could focus at near. To do this we used standard tests that are used by opticians during eye examinations.

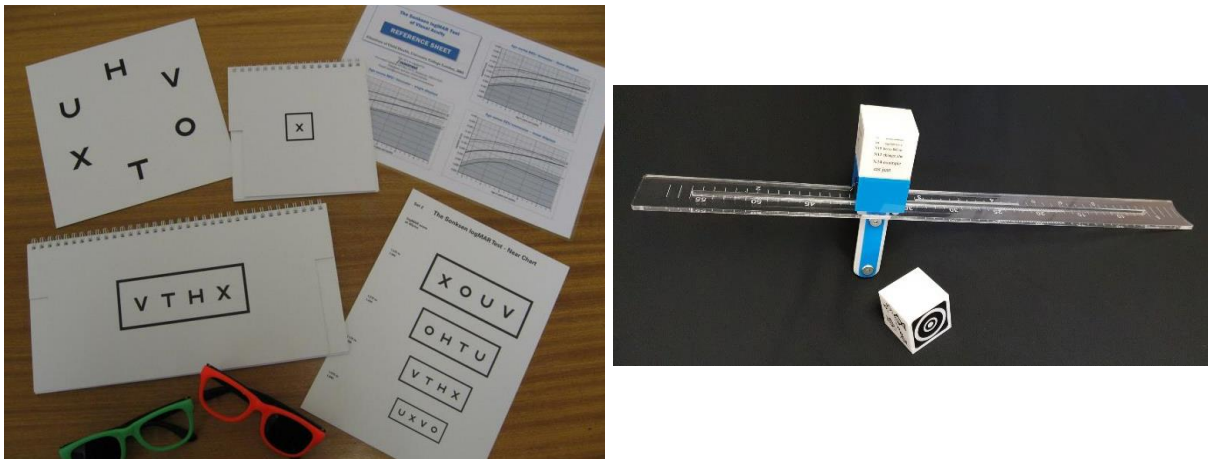

Figure 3. Letter chart that we used to measure how well participants could see (left), tool to measure how well participants could focus at near (right)

What did we find?

We found that in general people with Down's syndrome struggle a bit more to focus at near compared to people without Down's syndrome. Similarly, we also found that in general the level of vision in people with Down's syndrome is slightly reduced compared to people who do not have Down's syndrome. This is no different from what we already know from Dr Maggie Woodhouse's studies (Down's syndrome research Unit, Cardiff University).

However, we also found something new about near focusing in people with Down's syndrome and this is that the shape and size (thickness and length) of the ciliary muscle in people with Down's syndrome is not different to the shape and size of the ciliary muscle in people without Down's syndrome.

So, where does this leave us now?

This study has improved the understanding we had so far of near focusing in people with Down's syndrome. In conclusion, our results suggest that the origin of the near focusing deficit found in people with Down's syndrome is not likely to be due to the shape and size of the ciliary muscle, which is the muscle that contracts during the process of near focusing. The findings of this study open the door to study other possible origins for this near focusing deficit, which include sensory deficits such as the way in which blur is detected.

Thanks again for your help.

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